

James Beacham

EXPERIMENTAL PARTICLE PHYSICIST · DUKE UNIVERSITY

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Now

Post-doctoral researcher with Duke University (from October 2018), working on the ATLAS Experiment, based full-time at CERN

- Previously a post-doctoral researcher with Ohio State University (from June 2014 to October 2018), also full-time at CERN

Education

New York University

New York, New York

PH.D., EXPERIMENTAL PARTICLE PHYSICS — ADVISOR: KYLE CRANMER

May 2014

- Thesis Title: “‘A’ Searches: Looking for New Physics with the ATLAS, APEX, and ALEPH Experiments”

Research interests

I search for physics beyond the Standard Model (BSM), currently with the ATLAS experiment at the LHC. Within ATLAS I focus on BSM long-lived particle (LLP), exotic decays of the Higgs boson, and non-standard photon signatures, having introduced multiple novel analyses to ATLAS that have led to publications. I’m currently leading and coordinating the search in ATLAS data for emerging jets, an LLP signature that could be evidence of dark QCD. I am a member of the CODEX-b collaboration, a proposed dedicated experiment for searching for LLPs that decay outside of the detector volume of the LHCb experiment at CERN.

I founded the Long-Lived Particle Community initiative, [<https://cern.ch/longlivedparticles>] in 2016, an independent, long-running workshop series and working group comprising ATLAS, CMS, and LHCb analyzers, theorists, and those working on FASER, MilliQan, MATHUSLA, CODEX-b, etc., as well as any LLP project worldwide. I coordinate its activities, including fourteen workshops, and was editor of a major paper that was published in the Journal of Physics G and garnered over 100 citations in a year, with more than 320 to date.

I organize multiple other workshops and conferences around the world, both on collider physics and related topics such as high-performance computing as it relates to public health concerns and initiatives.

I lead hardware projects: To ensure we don’t miss discoveries in the upcoming high-luminosity era of the LHC, **I led a team that set up a test bench in support of the development of the data acquisition system for silicon strips for the ITk**, the upgrade of the ATLAS inner tracker, related work continuing to date.

I have extensive computing/data preparation experience, having served as prompt reconstruction coordinator for ATLAS data for 1.5 years.

I’m engaged with future collider experiments such as the FCC and CEPC and have been invited to participate in workshops and studies for such machines, as well as speak about LLP signatures in general at such projects and beyond.

Finally, **I’m a high-profile public keynote speaker / science communicator** [<https://jbbeacham.com/outreach>] who regularly speaks at events around the world.

Leadership positions

Founder/organizer of the Long-Lived Particle Community, in 2016, an independent, long-running workshop series and working group comprising ATLAS, CMS, and LHCb analyzers, theorists, and those working on FASER, MilliQan, MATHUSLA, CODEX-b, etc., as well as any LLP-related project worldwide. I coordinate its activities, including fourteen workshops, and was editor of a major white paper that was published in the Journal of Physics G and garnered over 100 citations in a year, with over 320 to date. [Spring 2016 to present]

Co-founder/organizer of the FIPs workshop series, dedicated to feebly-interacting particles [2019 to present]

Co-convener of the Unconventional signatures and Exotic Higgs (UEH) sub-group of the Exotics research group in ATLAS, appointing in my first year as a post-doc [April 2015 - April 2016]

Co-convener of the LHC Long-Lived Particle Working Group (distinct from the LLP Community initiative, above), an organized working group of the LHC Physics Centre at CERN (LPCC) dedicated to determining the most important LLP-related issues for ATLAS, CMS, LHCb, MoEDAL, and FASER in the current short-term future [2020 – 2022]

Coordinator of FELIX-based hardware test bench at CERN for R&D with silicon strips for DAQ system for ATLAS ITk upgrade [October 2018 to present]

Prompt data reconstruction coordinator (PROC) for ATLAS collision data at the CERN Tier0 data centre [May 2017 to January 2019]

Liaison for the Higgs-to-light-resonances physics domain of the beyond-the-Standard-Model Higgs sub-group (HBSM) of the Higgs research group in ATLAS, coordinating all analysis efforts searching for the SM Higgs boson decaying to exotic light particles, appointed in my first year as a post-doc [October 2014 to November 2017]

Selected papers

A complete list of my publications (over 500 of which are as an author with the ATLAS collaboration) can be found at <http://inspirehep.net/search?ln=en&p=beacham+james>. Additionally, a separate, more extensive, document of my publications is available upon request. Below is a selection of papers for which I was the or a primary contributor.

Not included here: Proceedings contributed in 2010 and 2012.

LONG-LIVED PARTICLE COMMUNITY INITIATIVE

Searching for long-lived particles beyond the Standard Model at the Large Hadron Collider at CERN [editor]

ARXIV:1903.04497

J.Phys.G 47 (2020) 9, 090501

September 2020

Long-lived particle signatures at the energy frontier

10.5281/ZENODO.4274125

Snowmass 2021 Letter of Interest

August 2020

LHC LONG-LIVED PARTICLE WORKING GROUP

Review of opportunities for new long-lived particle triggers in Run 3 of the Large Hadron Collider [editor]

ARXIV:2110.14675

CERN-LPCC-2021-01

October 2021

FUTURE COLLIDERS

A very high energy hadron collider on the Moon

ARXIV:2106.02048

New J. Phys. 24 023029

February 2022

FEEBLY-INTERACTING PARTICLES (FIPs) WORKSHOP AND GROUP

Feebly-Interacting Particles: FIPs 2020 Workshop Report

ARXIV:2102.12143

EPJC 81 (2021) 11, 1015

February 2021

PHYSICS BEYOND COLLIDERS GROUP

Physics Beyond Colliders at CERN: Beyond the Standard Model Working Group Report

ARXIV:1901.09966

J.Phys.G 47 (2020) 1, 010501

December 2019

ATLAS — AS PRIMARY AUTHOR OR CORE CONTRIBUTOR

Search for pairs of highly collimated photon-jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

ARXIV:1808.10515

PRD 99, 012008 (2019)

January 2019

Performance of the ATLAS global transverse-momentum triggers at $\sqrt{s} = 8$ TeV

<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PUBNOTES/ATL-DAQ-PUB-2018-001/>

ATL-DAQ-PUB-2018-001

March 2018

Search for resonances in diphoton events with the ATLAS detector at $\sqrt{s} = 13$ TeV

ARXIV:1606.03833

*JHEP*09 (2016) 001

September 2016

Search for new phenomena in events with at least three photons collected in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector

ARXIV:1509.05051

EPJC 76 (2016) 4, 210

April 2016

ATLAS — AS SUB-GROUP CONVENER

Search for magnetic monopoles and stable particles with high electric charges in 8 TeV pp collisions with the ATLAS detector

ARXIV:1509.08059

PRD 93, 052009

March 2016

A search for prompt lepton-jets in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector

ARXIV:1511.05542

JHEP 1602 (2016) 062

February 2016

Search for heavy long-lived multi-charged particles in pp collisions at $\sqrt{s} = 8$ TeV using the ATLAS detector

ARXIV:1504.04188

EPJC (2015) 75:362

August 2015

Search for long-lived, weakly interacting particles that decay to displaced hadronic jets in proton-proton collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector

ARXIV:1504.03634

PRD 92 (2015) 1, 012010

July 2015

RD42

A 3D diamond detector for particle tracking

[HTTP://INSPIREHEP.NET/RECORD/1458074](http://inspirehep.net/record/1458074)

- Frontier Detectors for Frontier Physics: Proceedings of the 13th Pisa Meeting on Advanced Detectors

NIMA 824 (2016) 402-405

July 2016

APEX

Search for a New Gauge Boson in Electron-Nucleus Fixed-Target Scattering by the APEX Experiment

ARXIV:1108.2750

Phys.Rev.Lett. 107 (2011) 191804

2011

ALEPH

Search for neutral Higgs bosons decaying into four taus at LEP2

ARXIV:1003.0705

JHEP 1005 (2010) 049

2010

Academic and research talks – selected

Not included here: Invited talks given remotely at international workshops and posters at workshops and conferences. For conference and workshops I've organized (and usually given introductions at) see the "Professional Activities" section.

ATLAS / LHC

CODEX-b: A transverse detector for long-lived particles at the LHC

PHYSICS BEYOND COLLIDERS ANNUAL WORKSHOP

Virtual
March 2021

Dark sector searches at the energy and accelerator frontiers: Near and far future

SNOWMASS 2021 COMMUNITY PLANNING MEETING

Virtual
October 2020

Searching for long-lived particles at current and future high-energy colliders

INTERPRETING THE LHC RUN 2 DATA AND BEYOND

ICTP, Trieste, Italy
May 2019

Searching for long-lived particles at the LHC

INTERPLAY BETWEEN PARTICLE AND ASTROPARTICLE PHYSICS (IPA2018)

Cincinnati, Ohio
October 2018

Searching for beyond-the-Standard Model Higgs bosons at ATLAS and CMS

25TH INTERNATIONAL CONFERENCE ON SUPERSYMMETRY AND THE UNIFICATION OF FUNDAMENTAL INTERACTIONS (SUSY17)

Mumbai, India
December 2017

Searches for long-lived particles at the LHC

FUTURE OF COLLIDER SEARCHES FOR DARK MATTER

Fermilab, Batavia, Illinois
July 2017

Dark Matter Searches and Combined Interpretations at the ATLAS Experiment at 13 TeV

5TH INTERNATIONAL CONFERENCE ON NEW FRONTIERS IN PHYSICS

Crete, Greece
July 2016

Searches Exploiting the Higgs Boson as a Dark/Hidden Sector Portal at the LHC: Run 1 Results and Run 2 Prospects [ATLAS + CMS results]

25TH INTERNATIONAL WORKSHOP ON WEAK INTERACTIONS AND NEUTRINOS (WIN2015)

Heidelberg, Germany
June 2015

FUTURE COLLIDERS AND DETECTORS

Searching for long-lived particles at future circular colliders — Prospects and unknowns

INTERNATIONAL WORKSHOP ON HIGH ENERGY CIRCULAR ELECTRON POSITRON COLLIDER

Beijing, China
Nov. 2018

Searching for long-lived particles at future circular colliders

INTERNATIONAL WORKSHOP ON HIGH ENERGY CIRCULAR ELECTRON POSITRON COLLIDER

Beijing, China
Nov. 2017

EXPERIMENTAL OVERVIEW

Lost in a Dark Photon Wood: Searches for Light Hidden Gauge Bosons at Colliders and Fixed Target Experiments

CHALLENGES IN THE DARK SECTOR: ALTERNATIVES TO THE WIMP PARADIGM WORKSHOP AT INFN FRASCATI

Frascati, Italy
Nov. 2015

APEX (DARK PHOTON EXPERIMENT AT JEFFERSON LAB)

APEX: The A Prime EXperiment at JLab

MULTIPLE LOCATIONS

Numerous talks given at international conferences and workshops; see long form CV for details.

Worldwide
2012-2015

ALEPH

$h \rightarrow 2a \rightarrow 4\tau$ at ALEPH

RENCONTRES DE MORIOND: QCD AND HIGH ENERGY INTERACTIONS

La Thuile, Italy
March 2010

SEMINARS

Where are the new discoveries at the Large Hadron Collider? Long-lived particles and searching for new physics at CERN and beyond

DEPARTMENTAL SEMINAR

*Texas A&M University, Florida
Institute of Technology, Southern
Methodist University
2021-present*

Searching for long-lived particles with the central detectors of the LHC and future high-energy colliders

CERN EP / TH FACULTY MEETING

CERN

June 2019

Avant-garde LHC: Inspiring the ATLAS detector to find physics it wasn't designed to find

DEPARTMENTAL SEMINARS

Multiple seminars on this topic presented at universities and laboratories worldwide

*Michigan State, Birmingham,
Michigan, SLAC, Manchester, Oxford,
UIUC
2017-2019*

Hardware and experimental operations

ATLAS

Code reviewer for ATLAS reconstruction software

CERN

March 2023 to present

- Reviewal of proposed changes to ATLAS reconstruction software, providing feedback, requests for modifications, and ultimately approval for readiness of inclusion into central ATLAS software

Coordination and development of FELIX-based test bench and R&D with silicon strips for DAQ system for ATLAS ITk upgrade

CERN

October 2018 to present

- Hardware testing, code development, logistics, team leading, etc. I set up a testing station from scratch and led a team to debug, develop, and eventually successfully run tests on chips. Currently participating in a more extensive setup for the same.

Coordinator for prompt reconstruction of ATLAS collision data (PROC) at the CERN Tier0 data centre

CERN

May 2017 to January 2019

- Prompt reconstruction of proton-proton and heavy ion collision data for ATLAS collaboration

Online shifter for high-level trigger desk in ATLAS control room

CERN

2015 to present

- Data-taking periods for proton-proton and heavy ion collisions

Studies of 2012 ATLAS MET trigger performance and prediction of rates and efficiencies in 2015

CERN

2013 to 2015

- Service work for ATLAS authorship qualification

RD42

Beam tests investigating future diamond-based particle detector technology at the Paul Scherrer Institute

Villigen, Switzerland

2014 to 2017

- Experimental setup and data-taking for beam tests investigating the potential usage of diamond-based particle detector technology for the planned ATLAS and CMS detector upgrades for the High-Luminosity LHC
- Shifter for data-taking runs with pion beams of varying flux incident on diamond samples with pad and pixel geometries

APEX

Target operation and DAQ shifter for APEX test run, Hall A, Jefferson Lab

Newport News, VA

July 2010

- Completed radiation worker training, assisted in calibration of PMTs in Hall A high resolution spectrometers, took shifts during data taking periods

Professional activities

PROGRAMS FOUNDED

Founder of independent working group and workshop series dedicated to long-lived particles (LLPs)

CERN

THE LONG-LIVED PARTICLE COMMUNITY INITIATIVE

Early 2016 to present

- Initiator and founder, with members of the CMS, LHCb, and ATLAS experiments, as well as theorists and phenomenologists, of the Long-Lived Particle (LLP) Community initiative in the beginning of 2016. Served as the main organizer of all of its activities under the banner of the LHC Physics Centre at CERN (LPCC), leading to fourteen workshops, an egroup with nearly 300 members, and a community white paper, made public in March of 2019 and subsequently published in the Journal of Physics G, charting a course for LLP searches in the future, of which I am one of two editors, along with theorist Brian Shuve; the white paper garnered more than 100 citations in about a year, with more than 320 to date. More information: <https://cern.ch/longlivedparticles>

WORKSHOPS AND CONFERENCES ORGANIZED

Core workshop organizer

CERN; ICTP, Trieste, Italy; CERN;
Nikhef, Amsterdam, Netherlands;
CERN; Ghent, Belgium; Virtually
April and October 2017; May and October
2018; May and November 2019; May and
November 2020; May and November
2021; May-June and October-November
2022; June 2023

SEARCHING FOR LONG-LIVED PARTICLES AT THE LHC AND BEYOND: {FIRST THROUGH THIRTEENTH} WORKSHOP(S) OF THE LLP COMMUNITY

- Core organizer of thirteen major workshops of the LLP Community initiative, devoted to searches for long-lived particles at the LHC among theorists and the ATLAS, CMS, LHCb experiments as well as dedicated projects such as FASER, MilliQan, MoEDAL, SHiP, MATHUSLA, CODEX-b, and more generally any experiment or project searching for LLPs around the world, such as fixed-target projects, beam-dumps, dark matter experiments, and future facilities such as the FCC, CEPC, CLIC/ILC. etc. — more information here: <https://longlivedparticles.web.cern.ch/node/26>

Organizer and host

Virtual and at CERN

EXAHEALTH 2021: EXASCALE COMPUTING AND MACHINE LEARNING FOR PUBLIC HEALTH

October 2021

- Core organizer, in conjunction with Chelonia Applied Science and CERN openlab, and host of a workshop exploring how exascale / high-performance computing and machine learning are used in the service of public health. More informatio here: https://indico.cern.ch/e/ExaHealth_2021

Core workshop organizer

Virtually and at CERN

FIPS 2020 AND 2022: WORKSHOPS ON FEEBLY-INTERACTING PARTICLES

September 2020 and October 2022

- Core organizer of two multi-disciplinary workshops devoted to searches for feebly-interacting particles (FIPs) – particles with very small coupling to the Standard Model – around the world. The workshops had 200-300 registrants and were well-received by CERN leadership.

Core workshop organizer

ICISE, Vietnam

NEW PHYSICS WITH EXOTIC AND LONG-LIVED PARTICLES: A JOINT ICISE-CBPF WORKSHOP

July 2019

- Core organizer of a workshop devoted to searches for new physics utilizing exotic and long-lived particles at facilities and projects around the world.

Core workshop organizer

CERN

LHC LONG-LIVED PARTICLE MINI-WORKSHOP

May 2016

- Core organizer for workshop devoted to long-lived particle searches in LHC Run 2 among theorists and the ATLAS, CMS, and LHCb experiments

Scientific organizing committee for workshop

Cosenza, Italy

SEARCHING FOR EXOTIC HIDDEN SIGNATURES WITH ATLAS IN LHC RUN 2: MINI-WORKSHOP ON THE DETECTION OF DARK

February 2016

SECTOR SIGNALS

SUMMER STUDENT MENTORSHIP

Supervisor of summer students

CERN

RESEARCH EXPERIENCE FOR UNDERGRADUATES PROGRAM AT CERN

Summer 2019, 2020, 2021, 2022

- Supervisor of summer students visiting CERN from the U.S. REU program.

Supervisor of summer students

CERN

CALIFORNIA STATE UNIVERSITY SUMMER STUDENT PROGRAMME AT CERN

Summer 2017, 2018

- Supervisor of three summer students visiting CERN from the California State University system, focusing on underserved groups in STEM fields.

Software

C++, Python, FORTRAN, UNIX/Linux and related OSs, shell scripting, XML, HTML, Git, ROOT/RooStats, Mathematica

Teaching

Invited lecturer

DK-PI SUMMER SCHOOL

Virtual (originally Vienna, Austria)

September 2020

Supervisor

SUMMER STUDENTS / INTERNS

CERN

Summers of 2017, 2018, and 2019

Teaching Assistant

MULTIPLE COURSES

New York University

2008 - 2010

Outreach / communication / public appearances

All events: <https://jbbeacham.com/outreach>

In addition to my research, I specialize in novel, high-impact engagement with non-specialists at popular events dedicated to science, technology, futurism, start-up culture, digital culture, entrepreneurship, design, and art/science around the world, including the American Museum of Natural History, the Royal Institution, the Guggenheim Museum Bilbao, SXSW, the Exploratorium, Gizmodo Studios, The Next Web Conference, and BBC MediaCityUK, among many others.

I enjoy engaging with emerging scientists via novel social media and am a prominent science communication personality on TikTok, with hundreds of thousands of followers, where my videos reach millions of people.

My talk, “How we explore unanswered questions in physics” [<https://go.ted.com/Cyy7>], was featured on TED.com and has been viewed more than 1.6 million times. I am regularly invited to appear on podcasts and radio shows, including NPR’s “Science Friday”; participate in documentaries on the BBC, Discovery, Smithsonian, and independent feature productions (such as 2019’s Chasing Einstein); and I’ve been featured in The New York Times, Wired, Gizmodo, Science News, and India Today, among others.

I maintain an artistic practice as a filmmaker, as well. I received a degree in film / cinema before training as a physicist (I have separate bachelor’s degrees in film studies and physics/math). I’m frequently invited to events and to participate in projects exploring the intersection of art and science. I regularly collaborate with other artists, and my work has been displayed internationally. For example, in 2015 I launched a project called Ex/Noise/CERN...

<https://exnoisecern.ch/>

...in collaboration with CERN, that explores the connections between particle physics an experimental music and film, to celebrate the LHC’s switch on to 13 trillion electron volts. The video [<https://exnoisecern.ch/film>] of the first episode was covered extensively in the popular music and science press and within a few days of being live was ranked among the top ten most-watched videos ever produced by CERN.